AMENDMENTS TO THE SPECIFICATION

Please replace the paragraph beginning at **page 1, line 27**, and insert the following rewritten paragraph:

Thus, technologies disclosed in, for example, Japanese Unexamined Patent Application Publication No. 2002-326173 (patent document 2) and PCT international publication WO/03/057427/A1 (patent document 3) have been proposed by the present applicant. According to the technologies disclosed in these patent documents ~~3 and 4~~2 and 3, an instantaneous desired gait composed of an instantaneous value of a desired motion (instantaneous desired motion) of a robot and an instantaneous value of a desired floor reaction force (instantaneous desired floor reaction force) is sequentially created using a first dynamic model (simplified model), which represents a relationship between motions of the robot (the positions and postures of individual portions) and floor reaction forces, such that a dynamic balance condition (a condition, such as the one in that a translational force component of a floor reaction force takes a desired value or a floor reaction force moment about a certain point takes a desired value) on the first dynamic model is satisfied. Then, the instantaneous desired gait is input to a second dynamic model (full model) wherein a part of the instantaneous desired motion (desired body position/posture, a desired moment about a desired ZMP, or the like) is corrected so as to generate a final instantaneous desired gait in a time series manner.

Please replace the paragraph beginning at **page 4, line 16**, and insert the following rewritten paragraph:

a floor reaction force component error calculating means for determining, on an arbitrary motion of the mobile robot, by using the first dynamic model and a predetermined second dynamic model having a dynamic accuracy that is higher than that of the first ~~mobile~~ dynamic model, a floor reaction force component error, which is a difference between the floor reaction force component generated on the second dynamic model by the motion and the floor reaction force component generated on the first dynamic model by the motion;

Please replace the paragraph beginning at **page 11, line 24**, and insert the following rewritten paragraph:

a floor reaction force component error calculating means for determining, on an arbitrary motion of the mobile robot, by using a predetermined first dynamic model of the mobile robot and a predetermined second dynamic model having a dynamic accuracy that is higher than that of the first ~~mobile~~ dynamic model, a floor reaction force component error, which is a difference between the floor reaction force component generated on the second dynamic model by the motion and the floor reaction force component generated on the first dynamic model by the motion; and

Please replace the paragraph beginning at **page 20, line 5**, and insert the following rewritten paragraph:

Further, it is evaluated by the evaluating means whether the floor reaction force component errors Aerr and Berr determined by the floor reaction force component error

calculating means from the provisional motion fall within the first permissible error range and the second permissible error range. In this case, the floor reaction force component error Aerr associated with the provisional motion indicates the difference between the first floor reaction force component produced on the second dynamic model by the provisional motion and the first floor reaction force component produced on the first dynamic model by the provisional motion, so that it means an error of the first floor reaction force component on the first dynamic model relative to a provisional motion. Similarly, the floor reaction force component error Berr associated with the provisional motion indicates the difference between the second floor reaction force component produced on the second dynamic model by the provisional motion and the second floor reaction force component produced on the first dynamic model by the provisional motion, so that it means an error of the second floor reaction force component on the first dynamic model relative to a provisional motion. Incidentally, the first permissible error range and the second permissible error range may be the same ranges.

Please replace the paragraph beginning at **page 42, line 11**, and insert the following rewritten paragraph:

the desired motion determining means repeats corrected motion determination processing for determining a motion after an n-th correction such that a result obtained by adding either an (n-1)th ZMP error ZMPerr(n-1) or a ZMP correction amount determined on the basis of at least the (n-1)th ZMP error ZMPerr(n-1) to a ZMP calculated on the first dynamic model by the motion after the n-th correction agrees with the desired ZMP, and the result obtained by adding either an (n-1)th translational floor

reaction force horizontal component error Ferr(n-1) or a floor reaction force correction amount determined on the basis of at least the (n-1)th translational floor reaction force horizontal component error Ferr(n-1) to the translational floor reaction force horizontal component produced on the first dynamic model by the motion after the n-th correction satisfies the permissible range, and convergence discrimination processing for discriminating whether a ZMP error change amount ΔZMPerr defined as either a difference between an n-th ZMP error ZMPerr(n) associated with the determined motion after the n-th correction and an (n-1)th ZMP error ZMPerr(n-1) associated with a motion after an (n-1)th correction or a difference between the n-th ZMP error ZMPerr(n) and the ZMP correction amount determined on the basis of at least the (n-1)th ZMP error ZMPerr(n-1), and a translational floor reaction force horizontal component error change amount ΔFerr defined as either a difference between an n-th translational floor reaction force horizontal component error Ferr(n) associated with the determined motion after the n-th correction and an (n-1)th translational floor reaction force horizontal component error Ferr(n-1) associated with a motion after an (n-1)th correction or a difference between the n-th translational floor reaction force horizontal component error Ferr(n) and the floor reaction force correction amount determined on the basis of at least the (n-1)th translational floor reaction force horizontal component error Ferr(n-1) have respectively converged to zero until the desired motion determining means determines at least that both the ZMP error change amount ΔZMPerr and the translational floor reaction force horizontal component error change amount ΔFerr have both converged to zero, ~~until it is determined that both have converged to zero,~~ and determines, as the desired motion, a corrected motion determined by last corrected motion determination processing in the repetitive processing.

Please replace the paragraph beginning at **page 49, line 26**, and insert the following rewritten paragraph:

Hence, in the first invention (or the fifth invention using this as an element thereof) described above, preferably, the desired motion, the provisional motion, and the corrected motion mentioned above are composed of time series of the instantaneous values of motions of the mobile robot during a predetermined period; ~~the~~ an m-th floor reaction force component error (m: integer satisfying $m \geq 0$) determined by the floor reaction force component error calculating means is composed of a time series of the difference in the predetermined period between an instantaneous value of the floor reaction force component produced on the second dynamic model at each time of a motion after an m-th correction by the motion after the m-th correction and an instantaneous value of the floor reaction force component produced on the first dynamic model at the time by the motion after the m-th correction; the predetermined permissible error range of the evaluating means is a permissible error range for a predetermined first characteristic amount in a pattern of the time series constituting the 0-th floor reaction force component error; the corrected motion determination processing by the desired motion determining means is the processing for determining, at each time t of the motion after the n-th correction, an instantaneous value of a motion after an n-th correction at the time t such that a result obtained by adding either a value at the time t of the (n-1)th floor reaction force component error or a value of a floor reaction force correction amount determined on the basis of at least the value to an instantaneous value FM(t) of the floor reaction force component produced on the first dynamic model

at time t by the motion after the n-th correction satisfies the permissible range at the time t; the floor reaction force component error change amount ΔFM is composed of a time series in the predetermined period of a difference between a value of the n-th floor reaction force component error at each time and a value of an (n-1)th floor reaction force component error at the time or a difference between a value of the n-th floor reaction force component error at each time and a value of the floor reaction force correction amount determined on the basis of at least a value of the (n-1)th floor reaction force component error at the time; and the convergence discrimination processing of the desired motion determining means is the processing for determining that the floor reaction force component error change amount ΔFM has converged to zero when a predetermined second characteristic amount in a pattern of the time series constituting the floor reaction force component error change amount ΔFM falls within a predetermined permissible change amount range (a thirteenth invention).

Please replace the paragraph beginning at **page 58, line 3**, and insert the following rewritten paragraph:

the convergence discrimination processing of the desired motion determining means is the processing for determining that the floor reaction force component error change amount ΔAerr has converged to zero when a predetermined third characteristic amount in a pattern of the time series constituting the floor reaction force component error change amount ΔAerr has fallen within a predetermined permissible change amount range for the third characteristic amount and also for determining that the floor reaction force component error change amount ΔBerr has converged to zero when ~~the~~ a

fourth characteristic amount in a pattern of the time series constituting the floor reaction force component error change amount ∆Berr has fallen within a predetermined permissible change amount range for the fourth characteristic amount (a fifteenth invention).

Please replace the paragraph beginning at **page 64, line 8**, and insert the following rewritten paragraph:

Similarly, in the seventh invention (or the eleventh invention using this as an element thereof) described above, preferably, the desired motion, the provisional motion, and the corrected motion described above are composed of time series of the instantaneous values of motions of the mobile robot during a predetermined period; out of the m-th ZMP error ZMPerr and a translational floor reaction force horizontal component error Ferr (m: integer satisfying $m \geq 0$) determined by the floor reaction force component error calculating means, the m-th ZMP error ZMPerr is composed of a time series of the difference, in the predetermined period, between an instantaneous value of a ZMP calculated on the second dynamic model at each time of a motion after the m-th correction in response to the motion after the m-th correction and an instantaneous value of a ZMP calculated on the first dynamic model at the time in response to the motion after the m-th correction; the m-th translational floor reaction force horizontal component error Berr is composed of a time series of the difference, in the predetermined period, between an instantaneous value of the translational floor reaction force component produced on the second dynamic model at each time of a motion after an m-th correction and an instantaneous value of the translational floor reaction force

horizontal component produced on the first dynamic model at the time by the motion after the m-th correction; the predetermined first permissible error range of the evaluating means is a permissible error range for a predetermined first characteristic amount in a pattern of a time series constituting the 0-th ZMP error ZMPerr(0) and the predetermined second permissible error range is a permissible error range for a predetermined second characteristic amount in a pattern of a time series constituting the 0-th translational floor reaction force horizontal component error Ferr(0); the corrected motion determination processing of the desired motion determining means is the processing for determining, at each time t of the motion after the n-th correction, an instantaneous value of a motion after an n-th correction at the time t such that a result obtained by adding either a value of the (n-1)th ZMP error ZMPerr(n-1) at time t or a value of the ZMP correction amount determined on the basis of at least the value to an instantaneous value of the ZMP calculated on the first dynamic model at time t in response to the motion after the n-th correction satisfies the desired ZMP at the time t, and a result obtained by adding either a value of the (n-1)th translational floor reaction force horizontal component error Ferr(n-1) at the time t or a value of the floor reaction force correction amount determined on the basis of at least the value to an instantaneous value of a translational floor reaction force horizontal component produced on the first dynamic model at the time t by the motion after the n-th correction satisfies the permissible range at the time t; the ZMP error change amount ΔZMPerr is composed of a time series, in the predetermined period, of either a difference between a value of the n-th ZMP error ZMPerr(n) at each time and a value of an (n-1)th ZMP error ZMPerr(n-1) at the time or a difference between a value of the n-th ZMP error ZMPerr(n) at each time and a value of the ZMP correction amount determined on the basis of at

least a value of the (n-1)th ZMP error ZMPerr(n-1) at the time; the translational floor reaction force horizontal component error change amount ΔFerr is composed of a time series, in the predetermined period, of either a difference between a value of the n-th translational floor reaction force horizontal component error Ferr(n) at each time and a value of an (n-1)th translational floor reaction force horizontal component error Ferr(n-1) at the time or a difference between a value of the n-th translational floor reaction force horizontal component error Ferr(n) at each time and a value of the floor reaction force correction amount determined on the basis of at least the value of the (n-1)th translational floor reaction force horizontal component error Ferr(n-1) at the time; and the convergence discrimination processing of the desired motion determining means is the processing for determining that the ZMP component error change amount ΔZMPerr has converged to zero when a predetermined third characteristic amount in a pattern of the time series constituting the ZMP error change amount ΔZMPerr falls within a predetermined permissible change amount range for the third characteristic amount and also for determining that the translational floor reaction force horizontal component error ~~difference~~ change amount ΔFerr has converged to zero when a predetermined fourth characteristic amount in a pattern of the time series constituting the translational floor reaction force horizontal component error change amount ΔFerr falls within a predetermined permissible change amount range for the fourth characteristic amount (a seventeenth invention).

Please replace the paragraph beginning at **page 69, line 7**, and insert the following rewritten paragraph:

Similarly, in the ninth invention (or the twelfth invention using this as an element thereof) described above, preferably, the desired motion, the provisional motion, and the corrected motion described above are composed of time series of the instantaneous values of motions of the mobile robot during a predetermined period; out of the m-th ZMP error ZMPerr and a translational floor reaction force horizontal component error Ferr (m: integer satisfying m≥0) determined by the floor reaction force component error calculating means, the m-th ZMP error ZMPerr is composed of a time series of the difference, in the predetermined period, between an instantaneous value of a ZMP calculated on the second dynamic model at each time of a motion after the m-th correction in response to the motion after the m-th correction and an instantaneous value of a ZMP calculated on the first dynamic model at the time in response to the motion after the m-th correction; the m-th translational floor reaction force horizontal component error Berr is composed of a time series of the difference, in the predetermined period, between an instantaneous value of the translational floor reaction force horizontal component produced on the second dynamic model at each time of a motion after an m-th correction and an instantaneous value of the translational floor reaction force horizontal component produced on the first dynamic model at the time by the motion after the m-th correction; the corrected motion determination processing of the desired motion determining means is the processing for determining, at each time t of the motion after the n-th correction, an instantaneous value of a motion after an n-th correction at the time t such that a result obtained by adding either a value of the (n-1)th ZMP error ZMPerr(n-1) at time t or a value of the ZMP correction amount determined on the basis of at least the value to an instantaneous value of the ZMP calculated on the first dynamic model at time t in response to the motion after the n-th correction satisfies

the desired ZMP at the time t, and a result obtained by adding either a value of the (n-1)th translational floor reaction force horizontal component error Ferr(n-1) at time t or a value of the floor reaction force correction amount determined on the basis of at least the value to an instantaneous value of a translational floor reaction force horizontal component produced on the first dynamic model at the time t by the motion after the n-th correction satisfies the permissible range at the time t; the ZMP error change amount ΔZMPerr is composed of a time series, in the predetermined period, of either a difference between a value of the n-th ZMP error ZMPerr(n) at each time and a value of an (n-1)th ZMP error ZMPerr(n-1) at the time or a difference between a value of the n-th ZMP error ZMPerr(n) at each time and a value of the ZMP correction amount determined on the basis of at least a value of the (n-1)th ZMP error ZMPerr(n-1) at the time; the translational floor reaction force horizontal component error change amount ΔFerr is composed of a time series, in the predetermined period, of either a difference between a value of the n-th translational floor reaction force horizontal component error Ferr(n) at each time and a value of an (n-1)th translational floor reaction force horizontal component error Ferr(n-1) at the time or a difference between a value of the n-th translational floor reaction force horizontal component error Ferr(n) at each time and a value of the floor reaction force correction amount determined on the basis of at least the value of the (n-1)th translational floor reaction force horizontal component error Ferr(n-1) at the time; and the convergence discrimination processing of the desired motion determining means is the processing for determining that the ZMP component error change amount ΔZMPerr has converged to zero when a predetermined third characteristic amount in a pattern of the time series constituting the ZMP error change amount ΔZMPerr falls within a predetermined permissible change amount range for the

third characteristic amount and also for determining that the translational floor reaction force horizontal component error ~~difference~~ change amount ΔFerr has converged to zero when a predetermined fourth characteristic amount in a pattern of the time series constituting the translational floor reaction force horizontal component error change amount ΔFerr falls within a predetermined permissible change amount range for the fourth characteristic amount (an eighteenth invention).

Please replace the paragraph beginning at **page 106, line 23**, and insert the following rewritten paragraph:

Fig. 8 illustrates a structure of a semi-full model. As shown in the figure, the semi-full model is a model that has corresponding mass points in the body 3, each foot 22, and in the portion near the knee joint of each leg body 2 (the portion adjacent to the knee joint of a thigh link), respectively, the body 3 having an inertia (inertial moment) Ib about the body mass point. In the semi-full model, the relationship between the motions of the robot 1 and floor reaction forces is described as the relationship between the translational motions of the mass points and the posture changing motions of the body 3 and floor reaction forces (the translational floor reaction forces and the floor reaction force moments about desired ZMPs), as with the aforesaid simplified model, although the dynamic equations will be omitted. The semi-full model has dynamic accuracy that is higher than that of the aforesaid simplified model. To be more specific, the fact that the dynamic accuracy of the semi-full model is higher than that of the simplified model means that a floor reaction force generated on the semi-full model by an arbitrary desired motion of the robot 1 will ~~agree) more~~ agree more closely with an actual floor

reaction force that actually acts on the robot 1 when the actual robot 1 carries out the desired motion on a supposed floor surface than a floor reaction force generated on the simplified model by the desired motion will.

Please replace the paragraph beginning at **page 112, line 17**, and insert the following rewritten paragraph:

The normal turning gait is explained in detail in, for example, the aforesaid publication document 1 and ~~Japanese Patent Application No. 2000-352011~~PCT International Publication WO/02/040224/A1, so that detailed explanation thereof in the present description will be omitted. The outline thereof is given below.

Please replace the paragraph beginning at **page 112, line 22**, and insert the following rewritten paragraph:

In the present embodiment, the normal turning gait, which is a cyclic gait, is a gait for two steps of the robot 1. In other words, a gait composed of a first turning gait following the current time's gait and a second turning gait following the first turning gait is defined as the gait for one cycle of the normal turning gait, and the gait for one cycle is repeated. If the current time's gait to be generated is, for example, a running gait for the robot 1 to run (a gait having a one-leg supporting period and a floating period), then the first turning gait and the second turning gait of the normal turning gait are also running gaits, while if it is a walking gait for the robot 1 to walk (a gait having a one-leg supporting period and a two-leg supporting period), then the first turning gait and the

second turning gait of the normal turning gait are also ~~running~~ walking gait. This means that the basic gait mode of the first turning gait and the second turning gait are the same as that of the current time's gait.

Please replace the paragraph beginning at **page 119, line 19**, and insert the following rewritten paragraph:

A body inclination restoring moment ZMP-converted value peak value ZMPrecpeak~~ZMPrecpeek~~ determined in the processing of the flowchart shown in Fig. 12 indicates the peak value of a ZMP-converted value ZMPrec of a floor reaction force moment required for a body posture to approach a reference body posture (the amount of deviation from a desired ZMP providing a reference (a desired ZMP defined by a ZMP trajectory parameter determined in S022)) in a one-leg supporting period of the robot 1 (more specifically, the period from the moment immediately after the start of the one-leg supporting period to the moment immediately before the end thereof; hereinafter, it will be referred to as "the body inclination angle restoring period"), an example thereof being shown in Fig. 19. ZMPrec takes a trapezoidal pattern, as shown in the figure, the peak value thereof (the height of the trapezoid) being denoted by ZMPrecpeak~~ZMPrecpeek~~.

Please replace the paragraph beginning at **page 121, line 4**, and insert the following rewritten paragraph:

Subsequently, in S202, an initial (time Ts) body horizontal position, an initial body horizontal velocity, an initial body posture angular velocity, and the peak value of a body

inclination restoring moment ZMP-converted value on the simplified model are taken as search objects, and the candidates (Xs, Vx, ωbs, ZMPrecpeak~~ZMPrecpeek~~) of these search objects are provisionally determined (the initial values of candidate values of the search objects are determined). In this case, the provisionally determined candidate values may be basically arbitrary, and they may be determined on the basis of, for example, the initial states of a normal gait determined when the last time gait was generated. Incidentally, these values provisionally determined are the values observed in the supporting leg coordinate system of the first turning gait (the aforesaid next time's gait supporting leg coordinate system).

Please replace the paragraph beginning at **page 122, line 24**, and insert the following rewritten paragraph:

Subsequently, in S208, a gait (a provisional normal gait) is generated using the simplified model up to the time Ts+Tcyc (the terminating end of the normal gait) on the basis of the normal gait parameter that includes the candidate values of current search objects, the vertical position and the vertical velocity of the body 3, and ZMPrecpeak~~ZMPrecpeek~~. This processing will be described hereinafter.

Please replace the paragraph beginning at **page 124, line 4**, and insert the following rewritten paragraph:

Meanwhile, if the determination result of S214 is NO, then the candidates of a plurality of (four in the present embodiment) search objects obtained by changing the

values of Xs, Vx, ωbs, and ZMPrecpeak~~ZMPrecpeek~~ by predetermined extremely small amounts ΔXs, ΔVx, Δωbs, and ΔZMPrecpeak~~ΔZMPrecpeek~~ are determined in the vicinity of the candidate values of the current search objects (Xs, Vx, ωbs, ZMPrecpeak~~ZMPrecpeek~~), and the same processing as that of ~~S2088~~ S208 to S212 is carried out to determine the boundary condition errors corresponding to the candidates of the individual search objects on the basis of the normal gait parameter that includes the candidates of the individual search objects (the normal gait parameter having the search objects of the normal gait parameter corrected to the newly determined candidates).

Please replace the paragraph beginning at **page 124, line 17**, and insert the following rewritten paragraph:

Subsequently, in S218, the new candidates of the search objects (Xs, Vx, ωbs, ZMPrecpeak~~ZMPrecpeek~~) are determined by an exploratory technique, such as the steepest descent method or the simplex method, on the basis of the current (Xs, Vx, ωbs, ZMPrecpeak~~ZMPrecpeek~~) and the boundary condition errors corresponding to the individual candidates of the search objects in the vicinity thereof. Then, the processing from S206 is repeated again.

Please replace the paragraph beginning at **page 125, line 21**, and insert the following rewritten paragraph:

As described above, the values of (Xs, Vx, ωbs, ZMPrecpeak~~ZMPrecpeek~~),

which are the search objects, are determined such that the boundary condition of the normal gait is satisfied, and the values of the search objects are used to determine the initial state (including an initial divergence component), which is a state (the motion state of the body 3) at the original initial time (time 0).

Please replace the paragraph beginning at **page 128, line 3**, and insert the following rewritten paragraph:

Further, generally speaking, the translational floor reaction force error Ferr_p(k) denotes a time series (a time series for every predetermined time width Δk) of a difference between a translational floor reaction force produced on a semi-full model (a second dynamic model) by a motion of a gait generated using a simplified model (a first dynamic model) in the period from the initial time Ts to the terminal time Ts+Tcyc of a normal gait (the period of one cycle of a normal gait) and a translational floor reaction force produced on a simplified model. In the present embodiment, a gait is generated such that a translational floor reaction force horizontal component falls within a floor reaction force horizontal component permissible range, so that attention is focused on a translational floor reaction force horizontal component, and the time series of a difference between a translational floor reaction force horizontal component produced on the semi-full model and a translational floor reaction force horizontal component produced on a simplified model by a motion of a gait generated on a simplified model (a difference in an instantaneous value of a translational floor reaction force horizontal component at each time k) is defined as the time series of the translational floor reaction force error Ferr_p(k)~~Merr_p(k)~~.

Please replace the paragraph beginning at **page 147, line 8**, and insert the following rewritten paragraph:

Subsequently, in S502, it is determined whether the current time k at which an instantaneous value of a normal gait is to be created (the time in the normal gait that is being created) is in the body inclination angle restoring period. And, if the current time k is not time within the aforesaid body inclination angle restoring period, that is, if the current time k is in a period from an instant immediately before the end of a one-leg supporting period to an instant immediately after the start of the next one-leg supporting period (a period during which a desired floor reaction force vertical component is zero or in the vicinity of ~~zero)), then~~zero), then the processing of S504 to S518 is carried out. In these processing, first, a body horizontal acceleration αtmp attributable to a motion of the aforesaid body translational mode is calculated such that a floor reaction force moment horizontal component –Merr_p(k) obtained by subtracting a current value Merr_p(k) of a floor reaction force moment error (a floor reaction force moment horizontal component error) from an original desired floor reaction force moment horizontal component (=0) about a desired ZMP is generated on a simplified model (S504). αtmp denotes a provisional value of a body horizontal acceleration in a gait that is being created. Then, a translational floor reaction force horizontal component Fxtmp' obtained by adding a current value Ferr_p(k) of a translational floor reaction force error (a translational floor reaction force horizontal component error) to a translational floor reaction force horizontal component Fxtmp that balances out an inertial force attributable to a horizontal acceleration of the total center-of-gravity of the simplified

model (=Fxtmp+Ferr_p(k)) when the body horizontal acceleration is denoted by αtmp is compared with a floor reaction force horizontal component permissible range (S506 to S510). If this comparison reveals that Fxtmp' deviates from the floor reaction force component permissible range, then a translational floor reaction force horizontal component Fx' to be generated by a motion of the gait that is being created (this Fx' means a desired value of a component obtained by adding Ferr_p(k) to a translational floor reaction force horizontal component generated on the simplified model by the motion of the gait that is being created) is restricted to an upper limit value Fxmax or a lower limit value Fxmin of the floor reaction force horizontal component permissible range, or if Fxtmp' falls within the floor reaction force component permissible range, then Fxtmp is directly determined as Fx' (S512 to S514).

Please replace the paragraph beginning at **page 157, line 8**, and insert the following rewritten paragraph:

The processing shown in Fig. 17 will be schematically explained. A ZMP correcting parameter "a", which is the parameter defining a ZMP correction amount, and a first peak value ZMPrecpeaka~~ZMPrecpeeka~~ and a second peak value ZMPrecpeakb ~~ZMPrecpeekb~~ of the body inclination restoring moment ZMP-converted value are determined in the exploratory manner such that the terminal divergence component of the current time's gait agrees or substantially agrees with the initial divergence component of a normal gait (such that the current time's gait connects to the normal gait) on the simplified model. Here, the first peak value ZMPrecpeaka~~ZMPrecpeeka~~ and a second peak value ZMPrecpeakb~~ZMPrecpeekb~~ of the body inclination restoring

moment ZMP-converted value determined in the processing of Fig. 17 indicate two peak values of a pattern of a ZMP-converted value of a floor reaction force moment required to bring a body posture close to a reference body posture in the body inclination angle restoring period [Ta, Tb] of the current time's gait, an example thereof being shown in Fig. 20. There has been only one peak value of a body inclination restoring moment ZMP-converted value in the case of a normal gait; in the present embodiment, however, the first peak value ZMPrecpeaka~~ZMPrecpeeka~~ and the second peak value ZMPrecpeakb ~~ZMPrecpeekb~~ are used as two adjustable parameters of the body inclination restoring moment ZMP-converted value in order to make the body posture angle and the angular velocity thereof at the end of the current time's gait agree with the initial body posture angle and the angular velocity thereof, respectively, of a normal gait. In the present embodiment, as shown in Fig. 20, the body inclination restoring moment ZMP-converted value in the current time's gait takes a pattern having a shape combining a trapezoidal pattern in the first half of a one-leg supporting period and another trapezoidal pattern in the latter half thereof, the peak value of the trapezoidal pattern of the first half being the first peak value ZMPrecpeaka~~ZMPrecpeeka~~ and the peak value of the trapezoidal pattern of the latter half being the second peak value ZMPrecpeakb~~ZMPrecpeekb~~.

Please replace the paragraph beginning at **page 159, line 1**, and insert the following rewritten paragraph:

The processing of Fig. 17 will be explained in more detail. First, in S700, the initial candidates of the values of “a”, ZMPrecpeaka and ZMPrecpeakb~~ZMPrecpeeka~~

~~and ZMPrecpeekb~~, which are search objects, on the simplified model are provisionally determined. In this case, the initial candidates may be basically arbitrary or they may be determined, for example, on the basis of the values of "a", ZMPrecpeaka and ZMPrecpeakb ~~ZMPrecpeeka and ZMPrecpeekb~~ or the like that have been finally determined when creating a last time gait.

Please replace the paragraph beginning at **page 159, line 9**, and insert the following rewritten paragraph:

Subsequently, the loop processing of S704 to S714 is carried out. The processing will be schematically explained. First, in S704, a current time's gait (provisional current time's gait) is calculated using the current candidate values of "a", ZMPrecpeaka, and ZMPrecpeakb,~~ZMPrecpeeka, and ZMPrecpeekb,~~ which are search objects, and the simplified model. More specifically, the provisional current time's gait is calculated using a current time's gait parameter composed of a ZMP trajectory parameter that has been corrected on the basis of the current value of the ZMP correcting parameter "a", the current values of ZMPrecpeaka and ZMPrecpeakb~~ZMPrecpeeka and ZMPrecpeekb~~, and parameters other than the ZMP trajectory parameter determined in S026 (a foot trajectory parameter, a floor reaction force vertical component trajectory parameter, etc.), and the simplified model. More specific processing of S704 will be discussed hereinafter.

Please replace the paragraph beginning at **page 159, line 24**, and insert the following rewritten paragraph:

Then, in S706 to S716, the difference between the divergence component at the terminating end of the provisional current time's gait calculated in S704 (the time at which the foot of a free leg of the current time's gait is expected to land) and the initial divergence component q" of a normal gait (the component finally calculated in the aforesaid S024), the difference between the body posture angle at the terminating end of the provisional current time's gait and the initial body posture angle of the normal gait (the posture angle lastly calculated in the aforesaid S024), and the difference between the angular velocity of the body posture angle at the terminating end of the provisional current time's gait and the initial body posture angular velocity of the normal gait (the one lastly calculated in the aforesaid in the aforesaid S024) are determined. Then, it is determined whether all the values of these differences satisfy a condition in that they fall within permissible ranges (whether they are in the vicinity of zero), and if they do not satisfy the condition, then the values of the search objects are changed. This is repeated to eventually determine "a", ZMPrecpeaka and ZMPrecpeakb ~~ZMPrecpeeka and ZMPrecpeekb~~ as the corrected values of a gait parameter that allows the provisional current time's gait to connect to the normal gait on the simplified model.

Please replace the paragraph beginning at **page 161, line 26**, and insert the following rewritten paragraph:

Meanwhile, if the discrimination result of S712 is NO, then the candidates of a plurality of (three in the present embodiment) search objects obtained by changing the values of the individual parameters by predetermined extremely small amounts Δa,

ΔZMPrecpeaka, and ΔZMPrecpeakb ~~ΔZMPrecpeeka, and ΔZMPrecpeekb~~ are determined in the vicinity of the candidate values of the current search objects ("a", ZMPrecpeaka, ZMPrecpeakb)~~ZMPrecpeeka, ZMPrecpeekb)~~, and the same processing as that of S704 to S710 is carried out on the basis of the current time's gait parameters, which include the candidates of the individual search objects, to determine a set of errors (errq, θberr, ωberr) associated with each search object candidate.

Please replace the paragraph beginning at **page 162, line 11**, and insert the following rewritten paragraph:

Subsequently, in S716, the new candidates of the search objects ("a", ZMPrecpeaka, ZMPrecpeakb)~~ZMPrecpeeka, ZMPrecpeekb)~~ are determined by an exploratory technique, such as the steepest descent method or the simplex method, on the basis of the current candidates of the search objects ("a", ZMPrecpeaka, ZMPrecpeakb) ~~ZMPrecpeeka, ZMPrecpeekb)~~ and the sets of errors (errq, θberr, ωberr) associated with the candidates of the search objects in the vicinity thereof. Then, the processing from S704 is repeated again.

Please replace the paragraph beginning at **page 162, line 19**, and insert the following rewritten paragraph:

As described above, the current time's gait parameter is determined in the exploratory manner such that a current time's gait connects to a normal gait, ("a", ZMPrecpeaka, ZMPrecpeakb) ~~ZMPrecpeeka, ZMPrecpeekb)~~ being the search objects.

Please replace the paragraph beginning at **page 166, line 8**, and insert the following rewritten paragraph:

Supplementally, in the discrimination processing in S816, ΔMerr(k) and ΔFerr(k) may use the same types of characteristic amounts or may use different types thereof, as in the case of the aforesaid S316. In addition, ΔMerr(k) and ΔFerr(k) do not have to share the same permissible range of a characteristic amounts. Further, as in the case of S316, the discrimination processing of S816 not only discriminates the convergence of ΔMerr(k) and ΔFerr(k) in the repetitive processing of S818 to S828 but the first processing of S816 after the completion of the processing of ~~SS800~~ S800 to S812 also evaluates whether the floor reaction force moment error Merr_p(k) and the translational floor reaction force error Ferr_p(k) related to a gait created by the processing of S800 to S812 are respectively sufficiently small or not (whether the dynamic accuracy of a gait created by the processing of S300 to S312 is adequate or not). Incidentally, these evaluation processing and convergence discrimination processing may be separately carried out, as in the case of S316, and in such a case, the evaluation processing and the convergence discrimination processing may have different types of characteristic amounts or different permissible ranges of characteristic amounts.

Please replace the paragraph beginning at **page 167, line 2**, and insert the following rewritten paragraph:

A provisional current time's gait lastly generated in S028 as described above will

connect to a normal gait while satisfying a desired ZMP and a floor reaction force horizontal component permissible range on a semi-full model by a motion thereof (satisfying a boundary condition of a current time's gait). At this time, the provisional current time's gait is generated on the basis of the dynamics of the simplified model by taking into account the errors Merr_p(k) and Ferr_p(k) of a floor reaction force on the simplified model. Further, the instantaneous value at each time k of the current time's gait is generated by adding corrections based on the Merr_p(k) and Ferr_p(k) at that time. And, the Merr_p(k) and Ferr_p(k) used in this case are the ones in the state wherein the convergence discrimination result in S816 has switched to YES, so that they exhibit high reliability as the ones indicating an error of a floor reaction force produced on the simplified model. This makes it possible to promptly and efficiently determine the gait parameters ("a", <u>ZMPrecpeaka, and ZMPrecpeakb)</u> ~~ZMPrecpeeka, and ZMPrecpeekb)~~ of the current time's gait in an exploratory manner without causing a motion of the gait to diverge.

Please replace the paragraph beginning at **page 177, line 25**, and insert the following rewritten paragraph:

If the correction amounts Merr_p(k) and Ferr_p(k) are updated by expressions 10a and 10b as described above, then ΔMerr(k) and ΔFerr(k) may be said to mean the differences between the ~~floor reaction forces~~<u>correction amounts</u> Merr_p(k) and Ferr_p(k) used to correct a floor reaction force produced on the simplified model each time a gait is created and an error of a floor reaction force of a created gait in the loop processing of S314 to S328 in Fig. 13 or the loop processing of S814 to S828 in Fig. 18.

In other words, if the differences are close to zero, then it means that the floor reaction forces Merr_p(k) and Ferr_p(k) used to correct the floor reaction force produced on the simplified model have been appropriate.

Please replace the paragraph beginning at **page 183, line 2**, and insert the following rewritten paragraph:

Using the error ZMPerr_p(k) in place of Merr_p(k) in the aforesaid embodiments constitutes an embodiment of the seventh invention, the eighth invention, the eleventh invention, the twelfth invention, the seventeenth invention, and the eighteenth invention described above. In this case, to be more specific, in the first embodiment, in the processing of S306 and S322 in Fig. 13 or S806 and S822 in Fig. 18, Merr(k) determined in S418 in Fig. 14 may be divided by an instantaneous value of a floor reaction force vertical component at the appropriate time k and the result may be determined as a new ZMP error ZMPerr_p(k). At this time, in ~~414~~ S414 of Fig. 14, if the floor reaction force moment Msmpl(k) produced about the desired ZMP on the simplified model is calculated by actual computing of the simplified model, then the error ZMPerr_p(k) determined as described above means the difference between the ZMP calculated on a semi-full model from a motion of a gait that is being created by the processing of S306 and S322 in Fig. 13 or S806 and S822 in Fig. 18 and the ZMP calculated on the simplified model from the motion. Further, in S308 and S324 or S808 and S824, at each time k, a difference between a newly determined ZMP error and a ZMP error determined when a gait immediately preceding it was generated may be determined as a ZMP error change amount ∆ZMPerr(k), and this may be used in place

of ΔMerr for the discrimination processing in S316 or S816. This constitutes an embodiment of the seventh invention and the seventeenth invention (hereinafter referred to as the third embodiment).

Please replace the paragraph beginning at **page 185, line 15**, and insert the following rewritten paragraph:

Further, in the first to the fourth embodiments described above, the processing in Fig. 13 or Fig. 18 generates gaits that satisfy a desired ZMP and a floor reaction force horizontal component permissible range from the start to the end thereof, and then generates a gait (a normal gait or a current time's gait), to which corrections of the floor reaction force moment error Merr_p(k) and the translational floor reaction force error Ferr_p(k) have been added, from the start to the end thereof; alternatively, however, the generation of an instantaneous value of a gait that satisfies a desired ZMP and a floor reaction force horizontal component permissible range and the generation of an instantaneous value of a gait to which corrections of the floor reaction force moment error Merr_p(k) and the translational floor reaction force error Ferr_p(k) determined on the basis of a motion (provisional motion) of the gait have been added may be sequentially performed at each time k from the start to the end of the gait.